82-8.

COPPER

Its Effect Upon

STEEL

for

ROOFING TIN

AUG 1 1 '25

COPPER
Its Effect Upon
STEEL
for
ROOFING TIN

American Sheet and Tin Plate Company
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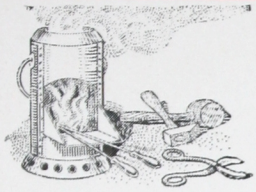
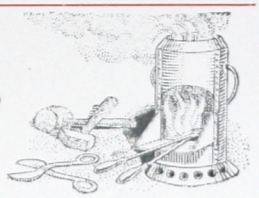
(Printed in U. S. A.)

Look for This Stamp— KEYSTONE COPPER STEEL *It Protects the User*



The Roof of *Quality* and *Service*

is made from



KEYSTONE COPPER STEEL ROOFING TIN

Keystone Copper Steel is an alloy made by the addition of a certain percentage of Copper to well made Steel, thereby greatly increasing its lasting or rust-resisting qualities under actual service conditions. This material is particularly adapted to the manufacture of Roofing Tin Plates and various Sheet Metal Products.

Terne Plate or Roofing Tin was subjected to criticism and disfavor as a roofing product, a number of years ago, primarily through the action of certain manufacturers and dealers, who, in their anxiety to meet competition, not only furnished material of an inferior quality, but misrepresented the amount of coating on various brands. These tactics, coupled with poor workmanship on the part of some tinners, naturally caused builders to look for other materials for roofing purposes, and the many cheap substitutes introduced from time to time have practically all been proved to be entirely unfit for permanent roofing. This resulted in the action of the American Sheet and Tin Plate Company, who, in order to protect the ultimate consumer, inaugurated the policy in 1906 of stamping all of its Roofing Tin with the weight of coating.

This Company also began experimenting with a view of supplying metal roofing superior to any which had been furnished in the past without materially increasing the cost. These experiments proved successful and announcement was made early in 1912 of the development of a product which would not only resist the acid test upon which much stress was then being laid; but which would also resist corrosion in actual service better than any iron or steel product on the market. This material is known as *Keystone Copper Steel* and is furnished in either Black Sheets, Galvanized Sheets, Terne Plate or Tin Plate.

The conclusions were based upon actual tests with *uncoated* sheets upon roofs in several parts of the country. One of these was located in the Pennsylvania coke regions, where the air contains notable amounts of sulphurous and sulphuric acid and other fumes from the coke ovens. In this district, iron and steel, unless protected, corrode very fast. Another station was located on the sea coast, where the air carries sodium chloride. The third station was located in a rural district where the air is quite pure and free from added corrosive agents. At each of these stations a skeleton wooden building was erected, 40x80 feet, with a sloping roof at an angle of about 18 degrees with the low side about 6 feet from the ground. The buildings were entirely open and free to the passage of air on all four sides, and the roofs were uncovered until the sheets were put on. The sheets were arranged in panels, the grades being separated from each other by an open space. Open spaces were also left between each *course* so that the drip from one row did not run onto the row below.

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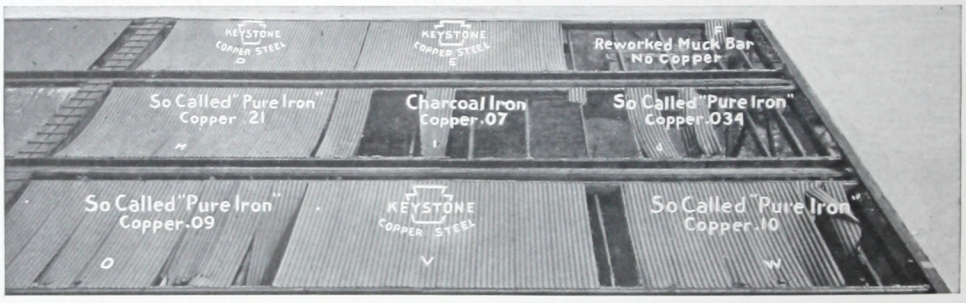
As previously stated, all of the sheets were entirely unprotected by paint or other coating, which allowed natural corrosion to start immediately and to proceed without interruption. In conducting these tests, both regular Bessemer and Open Hearth Steel, with and without Copper, were used; also sheets of the so-called "pure irons" which were purchased in the open market, and which, by the way, *analyzed about .07 copper.*

In order to avoid the possible uncertainty in comparing different heats of steel with and without copper and in order that the conditions, except the copper content, should be identical, it was decided for these comparisons to copperize portions of heats, leaving other portions of the same heat in their original condition. It will thus be seen that the tests were conducted fairly and that every element of doubt in so far as this was possible, was eliminated.

The results obtained from these investigations verified previous experiments along the same line, and proved conclusively that properly made steel containing from .15 to .25 per cent copper will resist corrosion from one and one-half to two times as well as the same steel without copper, and that it is also superior to the so-called "irons"—even though the latter contain a perceptible amount of copper. These results can perhaps best be appreciated by a glance at the illustrations of such tests. Numerous other tests have been conducted—all with similar results.

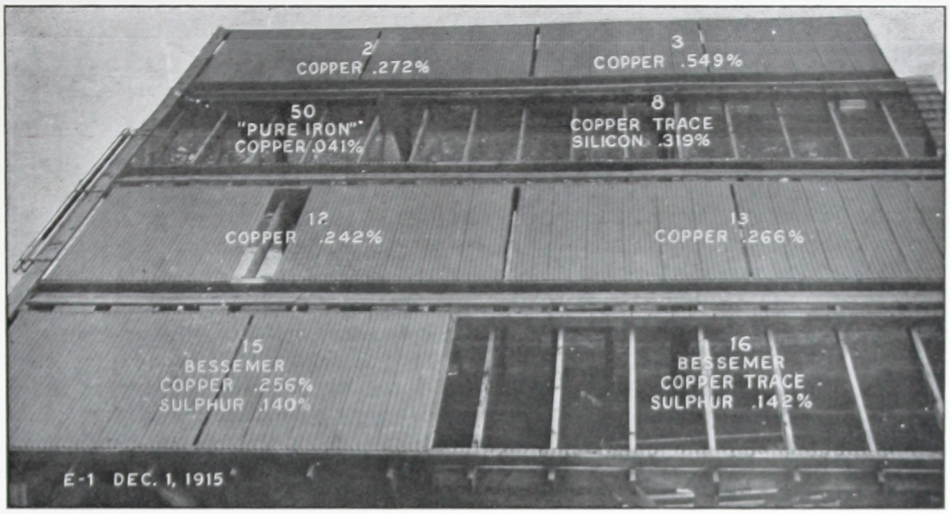
The question has been asked as to whether or not the presence of copper in steel would set up galvanic action. This would happen, no doubt, if copper came in mechanical contact with steel, but it is *most decidedly untrue* when the two metals form an alloy, as in the case of Keystone Copper Steel. In other words, the two metals are not present as copper and steel, but in the form of a perfect alloy.



This picture of the out-in-the-weather test roof, covered with uncoated black sheets, tells the whole story. The superiority of Keystone Copper Steel is clearly evidenced. The same advantage is shown in all of the other test roofs.

After establishing the foregoing facts, the American Sheet and Tin Plate Company decided to use Keystone Copper Steel exclusively in the manufacture of its Terne Plate for roofing purposes.

It is of interest to note that following the former extensive and thorough service tests of this Company, D. M. Buck, Metallurgical Engineer for the Company, and J. O. Handy, Director of the Pittsburgh Testing Laboratories, made still further investigations and tests of a very comprehensive character, embracing the various grades of iron and steel on the market as ordinarily used for roofing purposes. The results of these additional tests and scientific investigations are overwhelmingly in favor of copper steel for

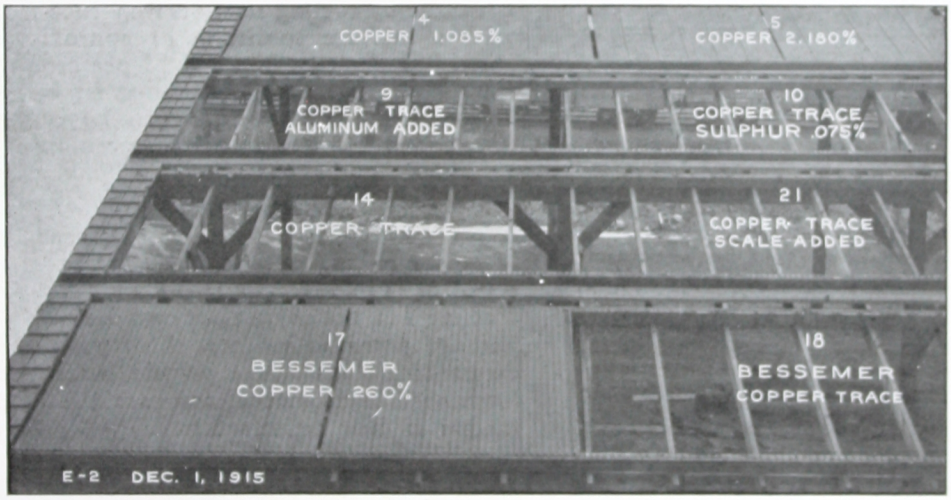


Results of Service Test at Scottdale, Pa., after about 1½ year's exposure.

Roof covered with uncoated black sheets.

Note the superior rust-resistance of Copper Steel, containing the proper percentage of copper.

Arguments are superfluous with results like these.



roofing purposes, and for all other uses requiring the highest degree of resistance to corrosion resulting from exposure to the action of the elements. This is further corroborated by other scientific investigators.

In Messrs. Buck and Handy's treatise entitled "Research on the Corrosion Resistance of Copper Steel," published in the Journal of Industrial and Engineering Chemistry by the American Chemical Society, in March, 1916, the following definite results have been established for copper steel:

> "Copper increases the resistance of steel and iron to atmospheric corrosion.
>
> "The most effective amount of copper to be used for this purpose is approximately .25 per cent. Smaller amounts of copper down to as little as .04 per cent have considerable influence in lessening corrosion, but the results are not so good as with the higher amounts mentioned above.
>
> "Steel containing .25 per cent copper outlasts 'pure iron' containing .05 per cent of the same; and steel containing .05 per cent copper is equally lasting to 'pure iron' containing a similar quantity.
>
> "Sulphur accelerates corrosion very markedly, as do sulphur oxides in the air. Copper in steel counteracts or retards both corroding influences."

In addition to the very careful and conclusive service tests noted above, the American Society for Testing Materials conducted a number of tests to prove the actual rust-resistance of various steel and iron sheets. After years of testing and proving under widely varying conditions of climate and atmosphere, the Society makes the following statement in their Proceedings, Vol. 21, 1921:

> "Copper Bearing metal shows marked superiority in rust-resisting properties as compared to non-copper-bearing metal of substantially the same general composition, from which superiority we may truly anticipate a marked increase in the service life for copper-bearing metals under atmospheric exposure of uncoated sheets."

This evidence is convincing and unquestioned by every well informed user—evidence that is not biased and cannot be controverted, and which is important to every architect, builder and contractor who uses sheet metal products in any form.

Similar results obtained by other scientific authorities, together with the large number of tests conducted by buyers and users, have demonstrated beyond question or argument that an alloy of copper and steel is the most durable metal that can be used for sheet metal roofing products.

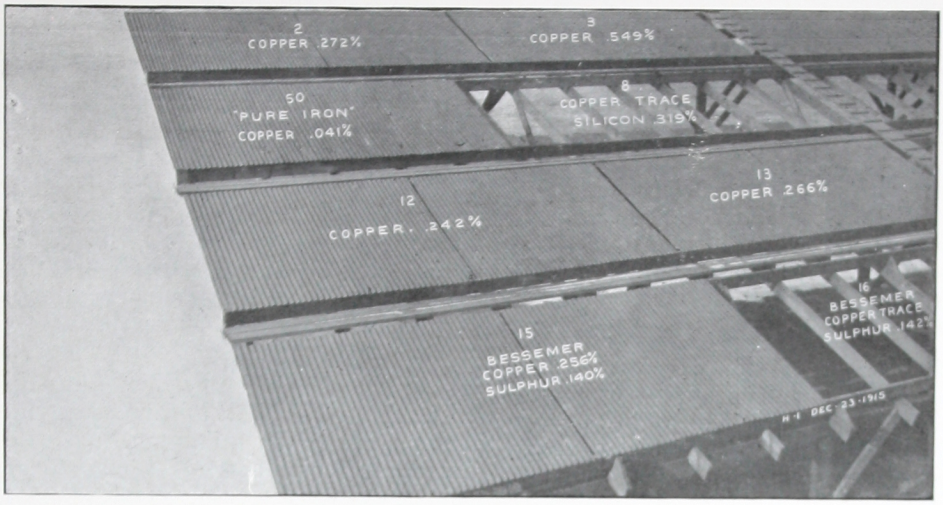
Highest Quality Standards Maintained

Terne Plate, or Roofing Tin, is a product made by coating steel or iron sheets with a mixture consisting of approximately 25 per cent Tin and 75 per cent Lead. Sheets coated in this manner by experienced workmen have been known to last over fifty years and can therefore be said to be the most durable roofing product on the market.

We now make a specialty of Terne Plate for roofing purposes, and are prepared to supply Keystone Copper Steel Roofing Tin, not only in our own brands, but are prepared to meet the requirements of jobbers whose private brands often necessitate unusual and careful attention in their manufacture.

The assertion from some quarters that "we cannot get good roofing tin any more" is not a fact. THE SAME GOOD QUALITY PLATES ARE STILL MADE; but the prevailing tendency to lessen cost by using cheaper grades, and labor, thereby sacrificing the old time quality, has been responsible for unsatisfactory results, and many erroneous statements. It is not to be expected that very light coated ternes will give the service of the old 30 to 40 pound grades, Give the tin roof a fair chance, by using good material and workmanship to start with. The results will not be disappointing.

While there have been many forms of roofings exploited in recent years, some

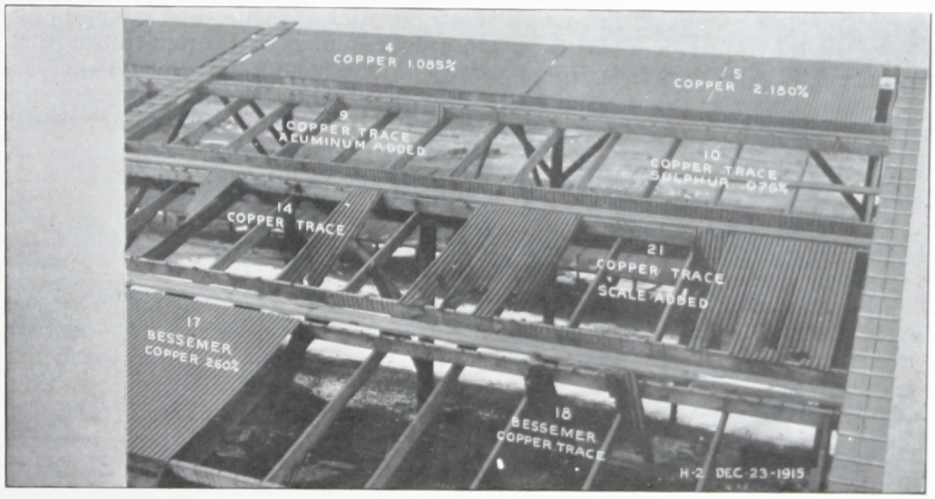


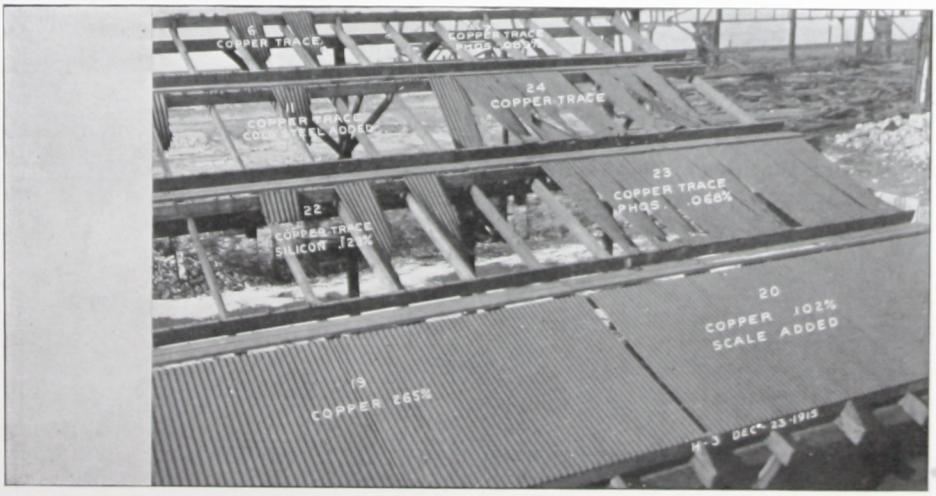
Another Weather Test Roof at McKeesport, Pa., showing condition at close of about 1½ year's exposure.

Roof covered with uncoated black sheets.

"Pure Iron" panel No. 50 showing signs of failure. Copper Steel alone stood the test of time and weather.

The amount of copper required to give best results is about .25%.





of them with extravagant claims of superiority, it has remained for the good old-fashioned tin roof to demonstrate its superior worth and advantages by giving good and satisfactory service right on the building.

Much has been said to prejudice the minds of builders and property owners against tin as a roofing. Some of this perhaps has been warranted, for it is probably true that inferior material is found on the market which is called "roofing tin." However, only true worth is counterfeited, and the value of a good tin roof is in nowise affected by faulty and worthless substitutes. The real truth is: the tin roof is coming more and more into favor and demand, and it is clearly the roofing of the future.

The first mission of a roof is protection —absolute and lasting; all its other features and advantages are secondary. The tin roof meets this first requirement perfectly. We have instances where roofs made of good roofing tin have lasted for over fifty years, and their service and protection has been faultless.

Advantages of Tin Roofing

The advantages secured by using high quality Terne Plates are many—more in fact than are found in any other roofing material. Tin Roofing embraces so many features of practical worth that it easily commands its place at the head of the list of all modern roofings. We mention but a few of the most important, but there are yet many other qualities of value that will appear to the user only as the years wear over his head:

COST—All things considered, the tin roof is most reasonable in cost. The best of terne plate can be obtained in any quarter at a very moderate price, and when the savings accruing from its use are considered, the item of first cost would be still further reduced.

SERVICE—The tin roof gives good service and will last indefinitely. It is impervious to all ravages of the elements, and is practicable in every climate. Those good old Southern homes—palatial monuments of comfort and stability, are roofed with tin, and its good service has never been questioned.

MAINTENANCE — The cost for maintenance is the minimum. The old threadbare complaint—"it has to be painted" is a misleading objection. Of course it has to be painted. So does wood work and finish. The saving in fire insurance alone will often more than cover this very nominal expense—in fact the only attention required by this, the best of roofs.

REPAIRS—The tin roof does not require endless repairs, but in case of accident or damage to the roof it can be repaired in any kind of weather and at small expense.

FIREPROOF—This is an important feature. The New York Times of July 5, 1922, stated that the fire losses in the United States reached the appalling amount of $1,672,722,677 for the five years from 1916 to 1920, inclusive; according to a report of the National Board of Fire Underwriters which made a study of the record of fires during that period. This gives an average annual property destruction of $334,544,535. A large proportion of this loss was the result of roof fires. A good tin roof is an effective "blanket policy" in case of fire.

LIGHTNINGPROOF — Protection from this source of frequent loss and damage means much to builders and owners of property in rural districts or communities removed from fire protection. We have no authentic instance of serious damage by lightning to buildings covered with tin roofs.

WEATHERPROOF — Extremes of weather do not affect the tin roof. The

sudden deluge, melting snow, or cracking, bulging ice, which is disastrous to many high priced roofings, can do no damage to the tin roof. The continuous, unbroken surface of good terne plate practically seals the top of the building against every condition of weather.

LIGHTNESS—Heavy roofings frequently cause buildings to settle, crack the plaster and ruin interior finish and decorations. With a tin roof, lighter and less expensive structural work may be used, and still have a better roof.

ADAPTABILITY—In its various forms, the tin roof is adapted to all forms and pitches of roofs; and it can be readily applied to irregular surfaces and otherwise difficult roofing propositions.

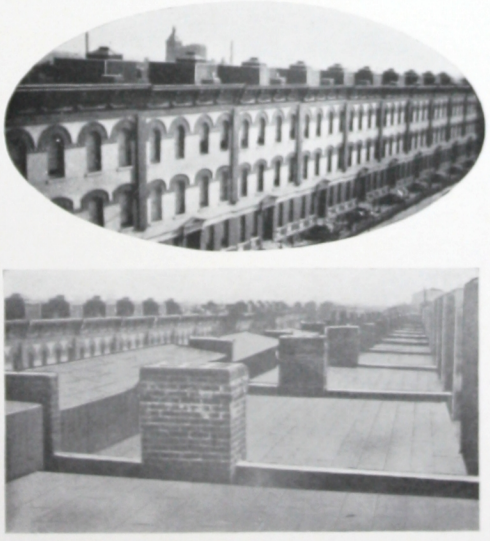
APPLICATION—The tin roof is easy to apply. The practical tinner is everywhere and his services are always available at a very reasonable figure. This is a decided advantage in case of accidents to the roof, alterations or repairs.

APPEARANCE—The tin roof always presents a neat and finished appearance. Particularly is this true of a standing seam roof, and when the ridge is finished with some simple sheet metal design, the roof is very attractive.

SANITARY AND CLEAN—This is important where water from the roof is run into cisterns. The tin roof is eminently clean and sanitary.

NOT EASILY DAMAGED—The presence of linemen or firemen upon the roof does not work untold injury and damage, with endless repair bills. The tin roof will withstand a great deal of punishment without serious damage.

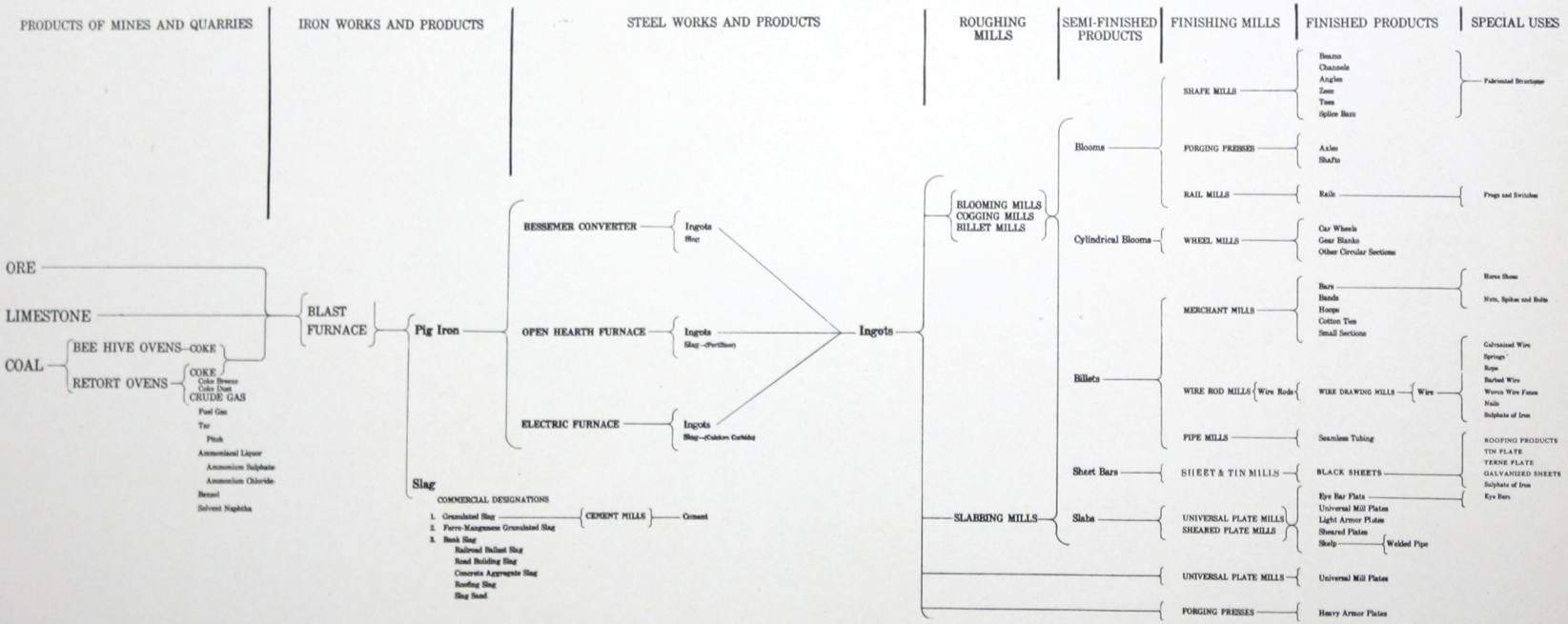
OTHER ADVANTAGES—In addition to the foregoing, when we consider its many other advantages in that it does not crack, warp, split, run, clog gutters, blow off, nor develop any of the annoying traits of many modern roofings, we believe the metal roof is unquestionably the best obtainable.



Five city blocks of Keystone Copper Steel tin roofs, Brooklyn, N. Y.

Diagram of the Manufacture of Steel

as Used for Sheet and Tin Mill Products

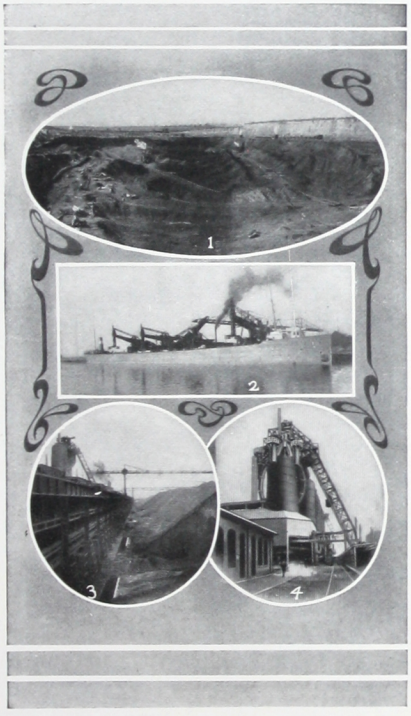


The diagram shows graphically the various stages in the manufacture of steel. It shows the technical names of the various equipment used in the manufacture of pig iron and steel, and the raw, semi-finished and finished products obtained therefrom in the various works of the United States Steel Corporation.

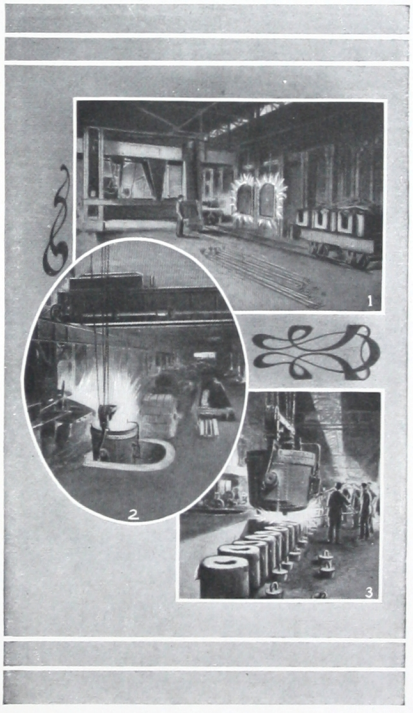
The Manufacture of Roofing Tin or Terne Plate

The material known as Roofing Tin or Terne Plate is composed of three metals —steel or iron, tin, and lead—hence the name "Terne Plate."

The greatest source of iron in this country is in the Lake Superior region, where the ore lies in vast bodies, underneath a relatively thin layer of earth.



1—Ore mine in Lake Superior region
2—Great Lakes ore steamer.
3—Ore piles at blast furnace.
4—Blast furnace, where ore is reduced to pig iron.



1—Open Hearth Furnaces.
2—Running the heat into ladle: Copper is added in ladle.
3—Casting the molten steel into ingots.

Practically all the tin used in this country comes from the Far East, where it is mined, smelted, and refined, it being imported in the form of pig tin. Lead is mined, smelted, and refined most largely in our Western States, and reaches the user in the form of pig lead.

The method of mining is usually to remove the earth and then to load the ore by means of steam shovels directly from its bed into railroad cars, these being borne by rails leading onto the piers in the upper lake ports. Large fleets of steamers of large cargo capacity are con-

tinuously in service, during the ice-free season of the lakes, transporting ore to the lower lake ports for immediate consumption and for winter stock. These steamers are loaded and unloaded with remark-

1—Blooming Mill and roll train; reducing ingot to bars.
2—Pile of Tin Plate bars.
3—Cutting the bars. Subsequent rolling is across the short bars, and not lengthwise as might be supposed.

able celerity by means of huge, ingenious mechanical devices.

With coke, made from special coal, mostly mined in the famous Connellsville region, and with limestone as a flux, the ore is smelted in a blast furnace, the metal thus produced being in the form of pig iron.

In this condition, iron is not malleable, and must be especially refined to make it suitable for the basis of Keystone Copper Steel Terne Plate. This is done in the open hearth furnace, into which is charged the raw material on one side, and from which, on the other, the refined steel is tapped into the ladle. Here the steel receives the copper, thus gaining that property of superior resistance to the corrosive influences of the atmosphere, that characterizes Keystone Copper Steel Terne Plate. After thorough diffusion of the added material, the homogeneous steel is teemed into molds, in which the steel solidifies in ingot form.

1—Hot Rolling. Two sheets are placed together, and doubled and redoubled, and heated and reheated, during the process of reducing the bars to the desired gauge.
2—Reheating Furnace. 3—Shearing. 4—Opening the pack.

The ingot, after having the mold stripped from it, and having been brought to the proper rolling temperature throughout, in a furnace known as

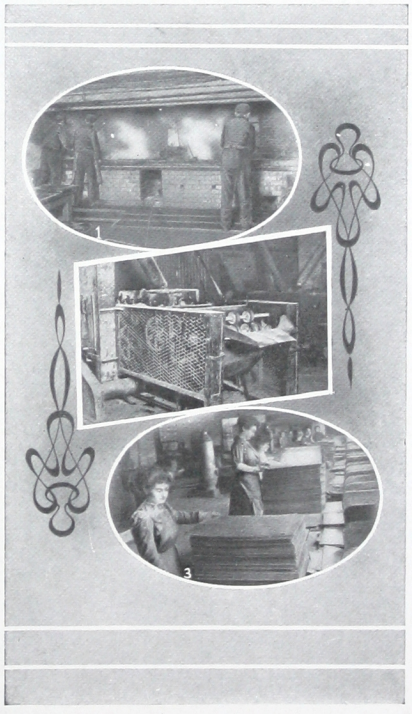
a "soaking pit," is reduced in cross section and increased in length by rolling, in the blooming mill. After having been cut to proper lengths, the billets, as they are then known, are carried by the roll

1—The Pickler. 2—Annealing Furnace.
3—Cold Rolling the plates.
4—Resquaring. 5—Washing the Plates.

train to the bar mills in which the steel is reduced to the proper thickness, the resulting bars being about eight inches wide. These are cut into lengths corresponding to the width of the sheets to be rolled.

At the rolling mill, the bars are heated in lots in a furnace, whence they are withdrawn in pairs, to be rolled in the hot mill. Each bar is rolled sidewise until its thickness is reduced sufficiently, when they are matched, and afterwards are rolled together. During the process of hot rolling to the desired gauge, the sheets are doubled and redoubled, and heated, and reheated to restore the proper working temperature, the entire sequence of operation being carried on with due regard for every feature that goes to make the excellence of the finished product—Keystone Copper Steel Terne Plate.

The pack of several sheets is sheared with proper allowance for subsequent operations, including resquaring, later, to



1—Hand Dipping the plates into the molten terne mixture.
2—Mechanically cleaning the plates.
3—Inspecting and assorting.

the finished size, and then it is opened, the several sheets being separated.

Steel oxidizes readily at high temperatures, and hot rolling strains the steel.

Hence the sheets after being freed from mill oxide by pickling in a dilute solution of sulphuric acid, are thoroughly washed and carefully annealed under cover.

That the coating may be smooth, the sheets are polished by cold rolling, the surfaces of the rolls being of a very high finish, and then, so that the roofer may lay his roof true, the sheets are accurately resquared.

To remove the slight strains of cold rolling, the sheets are again annealed under cover, and to prepare the sheets finally, for receiving their coating, they are again pickled, this time much more lightly, and thoroughly washed.

The sheets are coated in a molten bath of tin and lead, the heavier coatings being obtained by redipping by hand, especial care being taken to obtain, by proper distribution of the alloy and its thorough alloying with the base, that reinforced resistance to corrosion that has given Keystone Copper Steel Terne Plate its well-deserved high reputation.

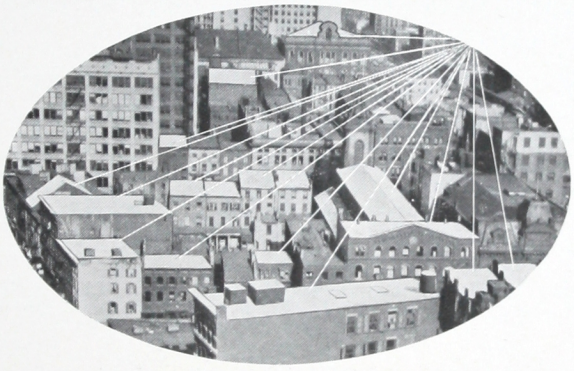
The Terne Plate is then carefully cleaned and inspected, and each perfect sheet impressed with the "stamp of quality"—*Keystone Copper Steel.*

Center Illustration—Stamping the plates "KEYSTONE COPPER STEEL"

High Quality—Long Service

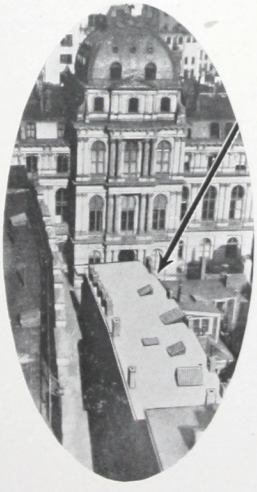
Home for Aged Women, Boston, Mass.—This MF Roof has given over 40 years' service

School Building at Jersey City, N. J. Roofed with MF over 15 years ago

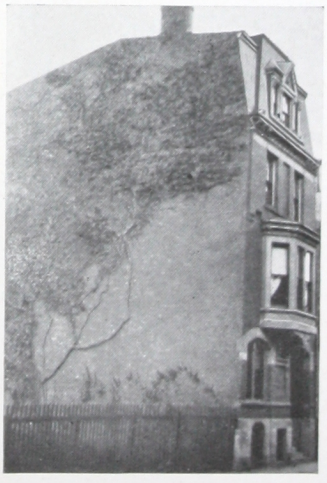


View of down town section of New York showing the use of tin roofing for fire protection

This building was covered with flat seam MF Roofing 25 years ago



One of our tin roofs which has given 35 years' service



Residence covered with MF which has given 46 years' splendid service

This Stamp— KEYSTONE COPPER STEEL on Every Plate

KEYSTONE COPPER STEEL
Roofing Tin

Strictly High Quality Plates—with Copper Steel alloy base

Look for the Keystone added to brand and weight of coating as indicated by MF brand

MF ROOFING TIN

is made only of the best material, by experienced workmen, and is carefully coated by the hand-dipping, Pure Palm Oil Process. MF carries 32 pounds coating, and is the most popular Roofing Tin manufactured, and has been made continuously since 1822. Look for the Keystone stamp added to regular brand.

U. S. EAGLE ROOFING TIN

Positively the highest quality Terne Plate produced in this country. Base of Keystone Copper Steel—coating 40 pounds, applied by the MF process, combined with Numethodd—these are roofing plates par excellence.

AMERICAN OLD STYLE ROOFING TIN

American Old Style AAAAA	40-Pounds Coating, Keystone Copper Steel
American Old Style AAAA	35-Pounds Coating, Keystone Copper Steel
American Old Style AAA	30-Pounds Coating, Keystone Copper Steel
American Old Style AA	25-Pounds Coating, Keystone Copper Steel
American Old Style A	20-Pounds Coating, Keystone Copper Steel

AMERICAN NUMETHODD ROOFING TIN

American Numethodd B	40-Pounds Coating, Keystone Copper Steel
American Numethodd D	30-Pounds Coating, Keystone Copper Steel
American Numethodd F	20-Pounds Coating, Keystone Copper Steel

AMERICAN ROOFING TIN

American Special	15-Pounds Coating, Keystone Copper Steel
American Extra	12-Pounds Coating, Keystone Copper Steel
American	8-Pounds Coating, Keystone Copper Steel

FIRE DOOR STOCK

20-Pounds Coating—carefully manufactured to meet the underwriters' requirements. This product will be found satisfactory for all fire door purposes.

LONG TERNE SHEETS

These sheets (sometimes referred to as Kalamein Iron) are carefully manufactured and are coated with a mixture of tin and lead. They are much used for fireproof construction. The limits of manufacture are gauges 16 to 30 inclusive, width up to 40 inches and length up to 120 inches, but the combination of extreme width and length is dependent upon the gauge. Write for full information as to your specific requirements.

KEYSTONE COPPER STEEL
Roofing Tin

Is also furnished to meet the individual requirements of sheet metal jobbers who have their own private brands. It is to your interest, however, to insist upon Plates of Keystone quality, the right weight of coating (20 to 40 pounds), and good workmanship—and to see that your plates are distinctly stamped "KEYSTONE COPPER STEEL"

Thus—

KEYSTONE
COPPER STEEL

You can buy Roofing Terne Plates with the positive assurance of lasting and satisfactory service—if you demand plates made from Keystone Copper Steel. Grades up to 40 pounds coating—*quality* supreme.

Hotel Vendome, Boston, Mass. The sloping parts of roof were covered with MF, and after 18 years, the tin was found in excellent condition.

This Stamp— KEYSTONE COPPER STEEL *on Every Plate*

Details for Tin Roofing and Sheet Metal Work

The following details prepared by Sweet's Catalogue Service, Inc., are of value and interest to all architects and draftsmen: By using high grade plates and correct workmanship, the architect can demonstrate beyond question that metal makes a better and safer roof, which will afford the maximum of protection from fire, storm, and weather. High quality plates are, and have been, available from the manufacturer. It requires only the specific demand that those responsible supply and use high grade materials.

Tin Roofs can be made both highly satisfactory and attractive when laid by the flat seam, standing seam, ribbed seam, or combination methods. After the initial coats of oxide paint, roofs and exposed sheet metal work may be painted to harmonize with any color scheme desired by the architect—a feature of importance and advantage that is frequently forgotten or overlooked.

Standard Tin Roofing and Sheet Metal Specifications

(1) MATERIAL—*Tin Roofs*—Where tin roofs are required by the drawings, all tin for roof and surfaces, including flashings, counterflashings, gutter linings, crickets, etc., shall be [MF, U. S. Eagle, American, or American Numethodd] Brand, Keystone Copper Steel, with [32 25, 30, 35, 40] lbs. coating. No substitute will be allowed and each sheet shall be stamped with name of brand and weight of coating.

(2) All tin plates unless otherwise specified shall be IC thickness.

(3) *Sheet Metal*—All sheet metal for sheet metal cornices, hanging gutters, down-spouts, skylights, ventilators, etc., shall be No. 24-gage Apollo-Keystone [Apollo Best Bloom] Galvanized Sheets.

(4) GUARANTY—All material and workmanship in connection with roof coverings, including all flashings, counterflashing, ventilators, scuttles, or similar work shall be guaranteed to be the materials specified and the workmanship up to approved standard.

(5) SHEATHING PAPER—Roof sections, where tin is required, to be covered with rosin-sized building paper weighing at least 6 lbs. per 100 sq. ft. and laid with 2-in. lapped joints.

(6) FLAT SEAM ROOFING—Edges of sheets shall be turned under ½ in.; all seams shall be well locked and well soaked with solder. Sheets to be fastened to sheathing boards by cleats spaced 8 in. apart, cleats locked into seams and fastened to roof with two 1-in. tinned barbed wire nails; no nails to be driven through sheets.

(7) STANDING SEAM ROOFING—Sheets shall be put together in long lengths in the shop, cross seams to be well locked and well soaked with solder; sheets to be made up the narrow way in the rolls and fastened to sheathing boards by cleats spaced 1 ft. apart.

(8) RIBBED ROOFING—All ribs to be securely nailed to sheathing and of sizes and spacings shown on detail drawings. Sheets to be made up the narrow way in rolls and fastened to ribs with cleats 1 ft. apart as detailed.

(9) CAUTION—No unnecessary walking over tin roof, or using same for storage of material shall be allowed. In walking on the tin, care must be taken not to damage paint nor break coating of tin. Rubber soled shoes or overshoes should be worn by men on the roof.

(10) FLASHING—Flash the intersection of all roofs and decks with dormers, chimneys, walls, and all vertical surfaces, about roof cants, about pipes passing through roofs to insure weathertight job, using kind of metal elsewhere specified, with locked and soldered joints.

(11) Base flashing shall be not less than 12 in. high and shall turn out on roofs not less than 4 in., or where roofing is metal shall be connected to same with locked and soldered joints.

(12) All base flashings shall be capped. The cap flashing shall be turned down over the base flashing not less than 4 in. The cap flashing shall be built into the masonry joints not less than 2 in., or into the reglets in stone not less than 1 in., and shall be secured into same with metal plugs leaded in smooth with the stone work. Step flashing shall be used for vertical surfaces in connection with pitched roofs where required. Flashings which are to be built in shall be supplied to the mason when or where he may require.

(13) Base flashing of shafts and skylights must be extended up to curbs and connected to eaves or gutters.

(14) Collars or flashing about plumbing and other pipes extending through roofs shall be turned up at least 8 in. about same. The plumber will calk aprons of lead in hub of pipe and turn down over these collars at least 6 in.

(15)—GUTTERS—Gutters shall be formed at eaves of all roofs as required of the sizes indicated on drawings, laid with continuous fall to drainage points. Wire baskets of same metal as gutters shall be placed over each outlet to leader. Hanging gutters and gutter linings shall be carried up 10 in. under the roofing connected with flashings and roofs with locked and soldered joints.

(16) Hanging gutters shall be made with clamped, riveted and soldered joints with roll on outer rim entirely covering continuous ¾-in. galvanized iron bar which shall be placed therein, supported at least every 4 ft. in length by straps with edges rolled on themselves to stiffen them. They shall be wrapped around the roll and iron bar on outer edge of gutter and riveted. All rivets, screws, straps, etc., shall be of same.

(17) LEADERS—Leaders shall be of ample capacity and same metal as gutters (except where otherwise specified,) and shall be set to all roofs and gutters as shown; hereinbefore specified or necessary.

(18) Interior leaders put in to take the discharge from roof cesspools will be of cast or wrought iron (as provided for under "Plumbing") extended to within 18 in. (or as near as practical) of cesspool outlet and finished with hub end. These shall be connected to gutters and roof cesspools with brass ferrules and 6-lb. lead tubes heavily soldered. Connecting tubes shall have graduated increase of 1 in. in diameter to top.

(19) DOWN-SPOUTS—Sheet metal down-spouts shall be as designed. They shall be flanged and soldered to the gutters and secured to the building with tinned conductor hooks or with metal strips ½ by ½ in. in cross section soldered to the down-spouts and fastened to woodwork with screws and to masonry by screws and lead sleeves. Straps and screws shall be galvanized.

(20) Where down-spouts connect with underground drainage system a suitable conductor head shall be provided (by the plumber) at the upper end of the drain pipe to receive the down-spout, and the joint between conductor head and drain pipe made with cement mortar well worked into place and finished smooth by the sheet metal contractor.

(21) METAL CORNICE—Furnish and set complete, sheet metal cornice as shown on detail drawings. To be of No. 26 [or No. 24] gage Apollo-Keystone Galvanized Sheets with ornamental work stamped out of heavy zinc.

(22) The cornice shall be built up on heavy galvanized forms bent to correct profiles and firmly anchored in place. All joints, angles, miters and fittings to be thoroughly well made and finished. Ornamental work, modillions, etc., shall be planted on watertight backings.

(23) SOLDER—Solder shall be of the best grade, bearing the manufacturer's name and guaranteed one-half tin and one-half lead—new metals. Use rosin only as a flux.

(24) PAINTING—All surfaces of tin and galvanized sheet metal work and iron and steel in connection therewith shall be thoroughly cleaned, all traces of flux removed, and painted as follows: Surfaces that will be unexposed after being placed shall be given 1 [2] coat of paint before being installed and all surfaces that will be exposed after installation shall be given 1 coat of paint within 3 days after being placed, and before the contract is completed all exposed surfaces shall be given 2 [1] additional coats of paint, the final coat to be tinted in colors to be selected by the architect.

(25) All paint on unexposed surfaces and the first coat on exposed surfaces shall be composed of 15 lbs. red lead to 1 gal. raw linseed oil with not more than ½ pt. oil dryer, and all subsequent coats shall be composed of 15 lbs. white lead to 1 gal. raw linseed oil with not more than 5% of oil dryer and the necessary color to give the desired tint.

(26) Before the galvanized sheet metal work on the exterior of the buildings is painted it must be treated with the following solution, which must be prepared in a glass or earthenware vessel: Dissolve 2 oz. copper chloride, 2 oz. copper nitrate, and 2 oz. sal ammoniac in 1 gal. clear soft water, and when solution is complete add 2 oz. of crude hydrochloric acid. Apply this solution to the sheet metal and allow it to become dry at least 24 hours before the red lead paint is applied.

(27) All paints shall be applied with hand brush and well rubbed in.

Construction Notes

PITCH OF ROOFS—Roofs constructed with a low pitch are made with flat seams, and should preferably be covered with high grade ternes, 20 pounds coating or heavier, from sheets 14x20 inches dimension rather than from sheets 20x28 inches, because the larger number of seams stiffens the surface and helps to prevent buckles and rattling in stormy weather. For flat seam roof, standard specifications require use of cleats. However, some roofers use 1-inch barbed and tinned roofing nails, driven 6 inches apart, well under the edge. They should be well covered up and the seams should be pounded down over the edge. Nails must never be exposed.

Steep tin roofs should be made with standing seams, and from sheets 20x28 inches, fastened down with cleats, not over 18 inches apart. The nails should be driven into the cleats only.

For spouts, valleys and gutters, heavily coated IX plate should always be used.

In late years the anxiety of some manufacturers to satisfy the demand of some users for cheap goods has been the cause of many inferior grades being introduced.

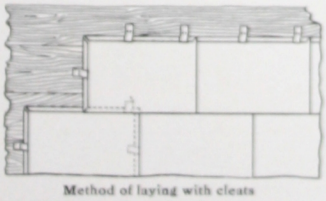
This latter class of material may suit for some purposes outside of roofing, or for roofs on temporary buildings; but for roofs that are expected to last, the "higher quality" plates should be used.

For valleys, spouts and gutters of a tin roof no other metal than terne plates should be used, because the galvanic action produced by different metals coming in contact with each other will cause disintegration under atmospheric influences.

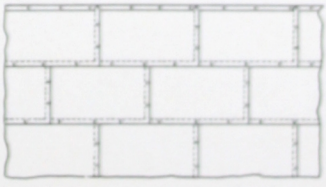
SHEATHING—Sheathing of good, well seasoned dry lumber such as white pine or spruce, narrow widths, free from resinous knots and holes, and of even thickness should be used. Boards should be laid with tight joints.

SHEATHING PAPER—There is a difference of opinion as to whether or not *sheathing paper* is to be recommended; but when the sheathing boards are as specified above, it is hardly necessary. However, if *sheathing paper* is used, it should be waterproof; no tar-paper or papers containing any trace of acid should be used. When no paper is used the tin must in all cases be painted on the underside with good reliable oil paint before it is laid and fastened on the roof.

FLAT SEAM ROOF—The roof should have an incline of not less than ½" per foot over the entire surface. Sheets 14" x 20" should be used, as the larger number of seams stiffens the surface and helps prevent buckles. This specification calls for the use of cleats. The work is often done by driving 1-inch barbed and *tinned* roofing nails well under the edges of the seam so as to be entirely covered by the tin, as shown below. The nails should be approximately 6" apart. If the tin is carefully laid in this



Method of laying with cleats

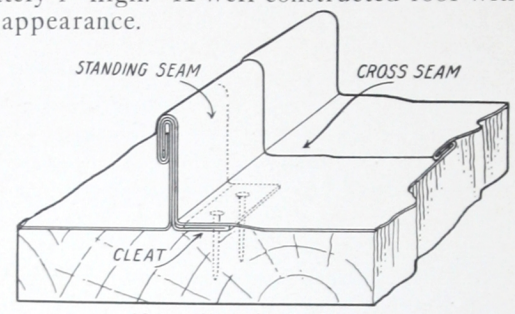


Method of laying with nails driven through sheets

way, it will give good results. However, the use of cleats is preferable. By the use of cleats the roofing tin plates are held firmly in place, and at the same time there is

enough elasticity to take care of the small amount of contraction and expansion in extreme weather, lessening the chances of straining the seams. These cleats are strips of the roofing tin, 1″ x 2″.

STANDING SEAM ROOF—The roof should have an incline of not less than 2″ per foot, preferably 4″ to 6″ per foot. Sheets 20″ x 28″ are used. Standing seams are finished approximately 1″ high. A well constructed roof with standing seams presents a very attractive appearance.



Method of laying Standing Seam

RIBBED AND COMBINATION TIN ROOFS—This method of application has very distinctive and attractive possibilities for residences and public buildings. The full details and methods of application have been outlined by a special architectural drawing and are shown on page 23 of this booklet. A careful study of this method of constructing tin roofs is commended to architects and builders.

PLATES REQUIRED TO COVER GIVEN AREA

The following tables will prove of assistance to architects, contractors, and builders in estimating the number of Plates required to cover a given area. The table at right also will give the weights per square of various well known roofing materials in addition to Roofing Tin Plates.

FLAT SEAM TIN ROOFING

Table showing number of 14″ x 20″ plates required to cover various areas in square feet with flat seam tin roofing. Flat seams, locked ½″, take 1½″ from both width and length; leaving covering area of 231¼ sq. ft.. In the table, a fractional part of a sheet is counted as a full sheet.

No. of sq. ft.	Sheets required	No. of sq. ft.	Sheets required	No. of sq. ft.	Sheets required	No. of sq. ft.	Sheets required
100	63	330	206	560	349	790	492
110	69	340	212	570	355	800	499
120	75	350	218	580	362	810	505
130	81	360	225	590	368	820	511
140	88	370	231	600	374	830	517
150	94	380	237	610	380	840	524
160	100	390	243	620	387	850	530
170	106	400	250	630	393	860	536
180	113	410	256	640	399	870	542
190	119	420	262	650	405	880	548
200	125	430	268	660	411	890	555
210	131	440	274	670	418	900	561
220	137	450	281	680	424	910	567
230	144	460	287	690	430	920	573
240	150	470	293	700	436	930	580
250	156	480	299	710	443	940	586
260	162	490	306	720	449	950	592
270	169	500	312	730	455	960	598
280	175	510	318	740	461	970	605
290	181	520	324	750	468	980	611
300	187	530	331	760	474	990	617
310	194	540	337	770	480	.....	....
320	200	550	343	780	486	.....	....

1,000 square feet, 623 sheets.

A package of 112 sheets, 14″ x 20″, covers approximately 180 square feet.

STANDING SEAM TIN ROOFING

Table showing number of 20″ x 28″ plates required to cover various areas in square feet with standing seam tin roofing. Standing side seams, ¾″ to ⅞″ high, locked ⅝″ to ½″, take 2¾″ from width; and flat end seams take 1½″ from length, leaving covering area of 457½ sq. in. In the table a fractional part of a sheet is counted as a full sheet.

No. of sq. ft.	Sheets required	No. of sq. ft.	Sheets required	No. of sq. ft.	Sheets required	No. of sq. ft.	Sheets required
100	32	330	104	560	177	780	246
110	35	340	108	570	180	790	249
120	38	350	111	580	183	800	253
130	41	360	114	590	186	810	256
140	45	370	117	600	190	820	259
150	48	380	120	610	193	830	262
160	51	390	123	620	196	840	265
170	54	400	127	630	199	850	268
180	57	410	130	640	202	860	271
190	60	420	133	650	205	870	275
200	64	430	136	660	208	880	278
210	67	440	139	670	212	890	281
220	70	450	142	680	215	900	284
230	73	460	145	690	218	910	287
240	76	470	149	700	221	920	290
250	79	480	152	710	224	930	294
260	82	490	155	720	227	940	297
270	86	500	158	730	231	950	300
280	89	510	161	740	234	960	303
290	92	520	164	750	237	970	306
300	95	530	168	760	240	980	309
310	98	540	171	770	243	990	312
320	101	550	174	.....	.....	.....	....

1,000 square feet, 316 sheets.

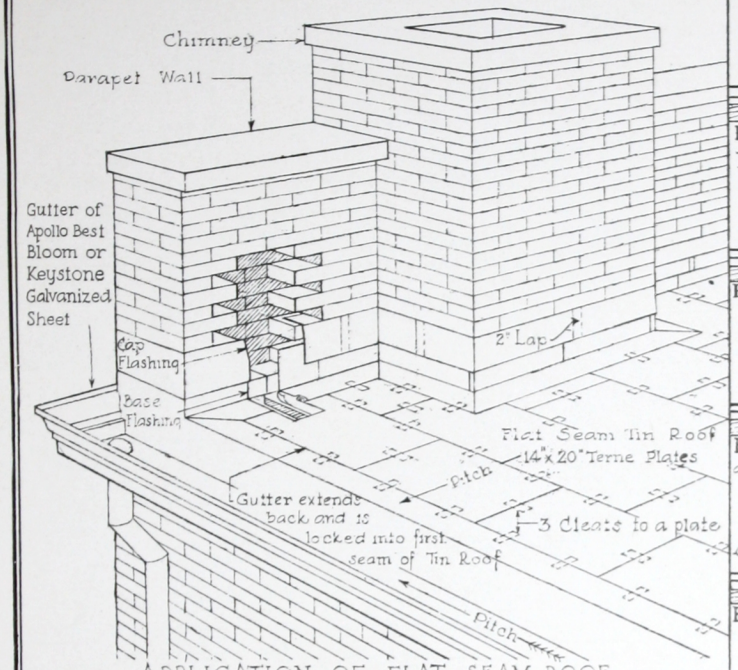
A package of 112 sheets, 20″ x 28″, covers approximately 356 square feet.

WEIGHTS OF ROOFINGS

Table showing approximate weights per square foot of various materials used for roofing.

MATERIAL	Av. Wt. lb. per sq. ft.
Corrugated Galvanized Sheets, No. 20; without sheathing	2¼
Copper, No. 22 B. & S. G.	1¼
Felt, 2 layers	½
Felt and Asphalt, without sheathing	2
Glass, ⅛ inch thick	1¾
Hemlock sheathing, 1 inch thick	2½
Lath and plaster ceiling (ordinary)	6 to 8
Lead, ⅛ inch thick	7½
Mackite, 1 inch thick, with plaster	10
Neponset roofing, felt, 2 layers	½
Shingles, 6x18—⅓ to weather	2
Skylight of glass, ⅛ to ½ inch, inc. frame	4 to 10
Slag roof, 4-ply with cement and sand	4
Slate, ⅛ inch thick, 3 inch double lap	4½
Slate, ¼ inch thick, 3 inch double lap	6¾
Spruce sheathing, 1 inch thick	2¼
Terne plate, IC, without sheathing	⅝
Terne plate, IX, without sheathing	¾
Tiles (plain) 10½x6¼x⅝—5¼ inches to weather	18
Tiles (Spanish) 14½x10½—7¼ inches to weather	8½
White pine sheathing, 1 inch thick	2¼
Yellow pine sheathing, 1 inch thick	3½
Zinc, No. 20, B. & S. G.	1¼

Note the advantage of using sheet metal to reduce weights on roofs.



APPLICATION OF FLAT SEAM ROOF TO FLAT ROOF

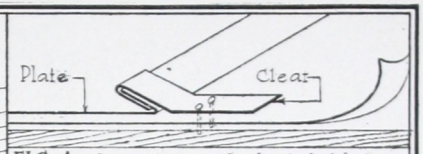


FIG. 1 First plate and cleat laid in position Cleat nailed

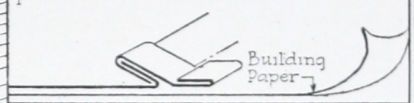


FIG. 2 End of cleat to be bent back over nails

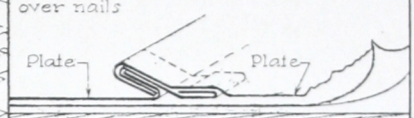


FIG. 3 Second plate laid over cleat and joined with first plate

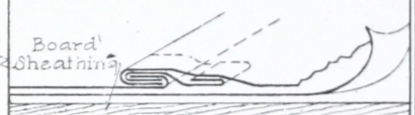
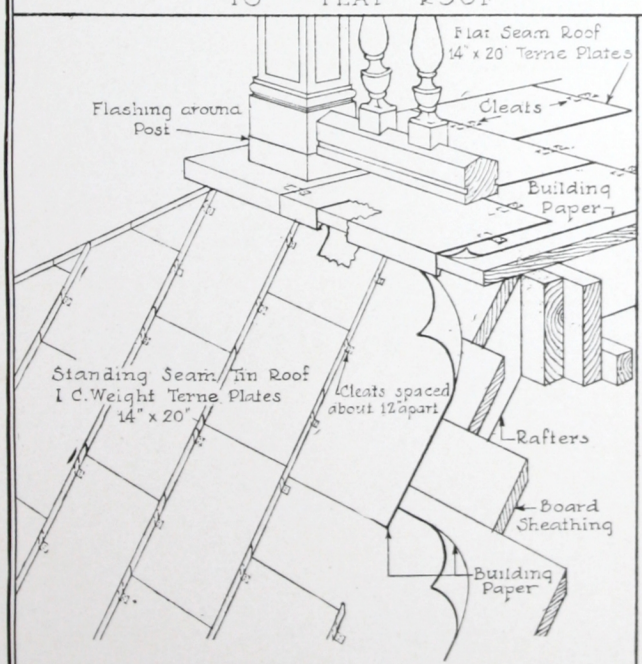
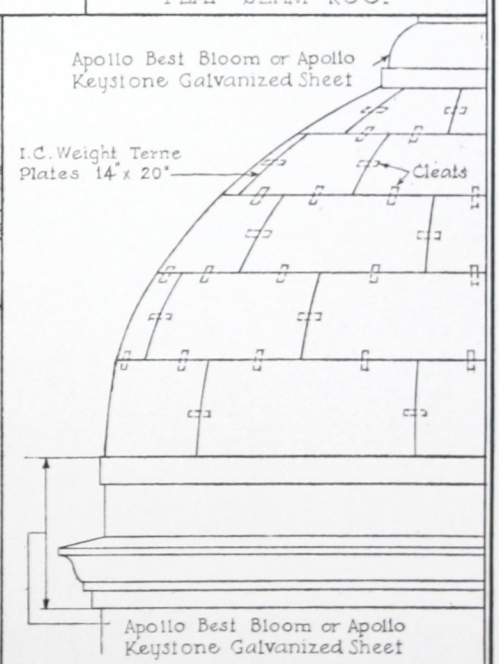


FIG. 4 Final operation. Seam flattened.

VARIOUS STEPS IN LAYING FLAT SEAM ROOF

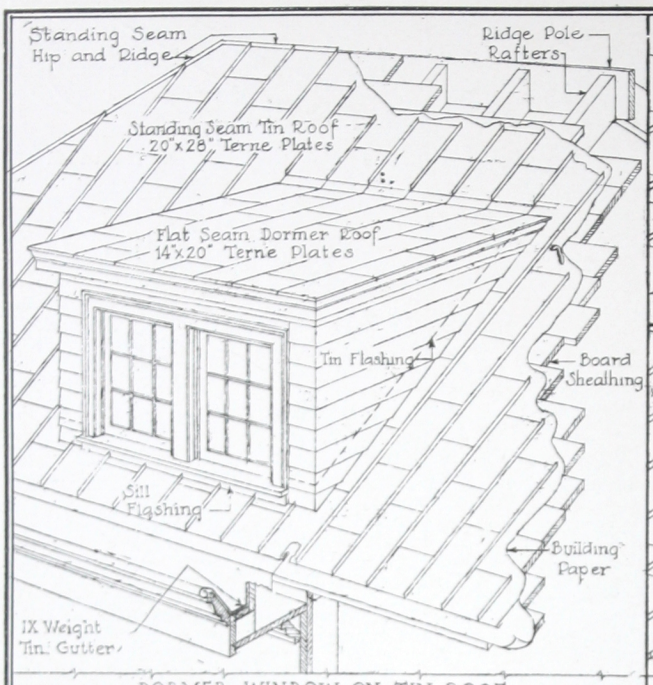


APPLICATION OF FLAT SEAM ROOF TO DECK ROOF

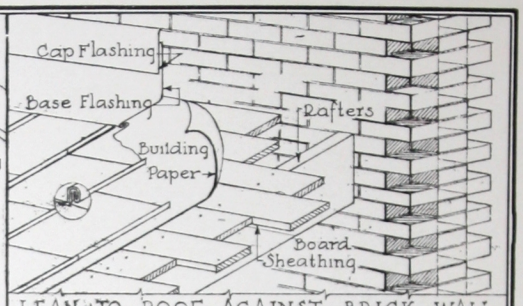


APPLICATION OF FLAT SEAM ROOF TO DOMICAL ROOF

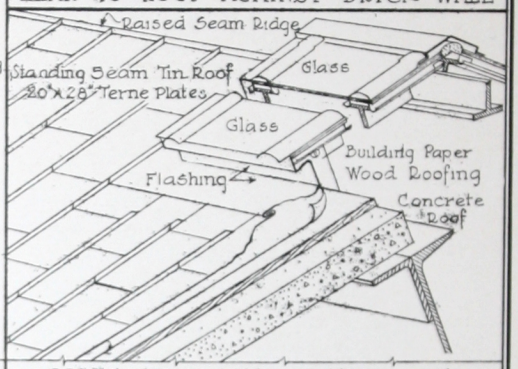
DRAWN BY SWEET'S CATALOGUE SERVICE, INC.	EXAMPLES OF LAYING AND FLASHING FLAT SEAM TIN ROOFS	NOT DRAWN TO SCALE DATE-JUL.'20	DRWG 1



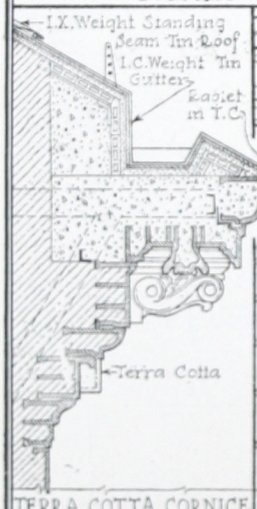
DORMER WINDOW ON TIN ROOF



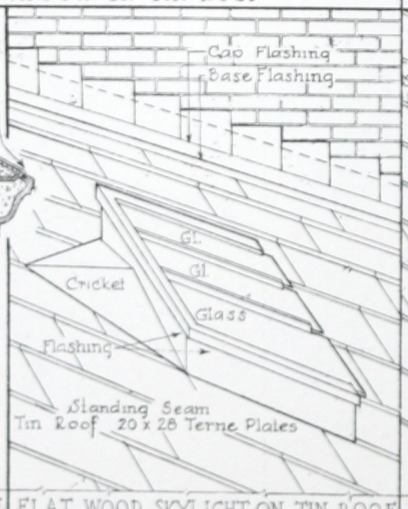
LEAN-TO ROOF AGAINST BRICK WALL



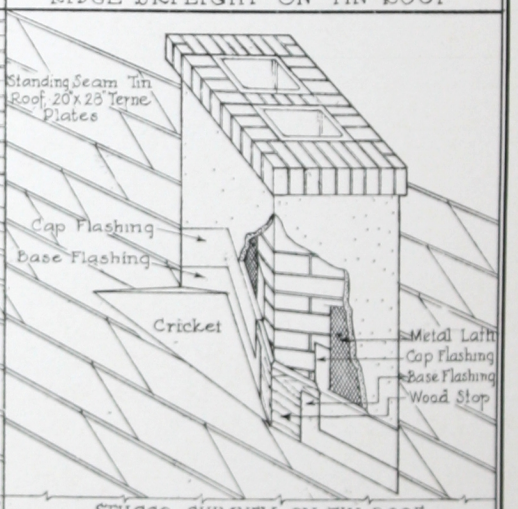
RIDGE SKYLIGHT ON TIN ROOF



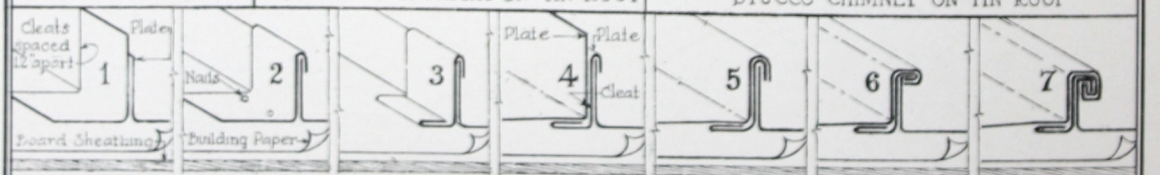
TERRA COTTA CORNICE



FLAT WOOD SKYLIGHT ON TIN ROOF



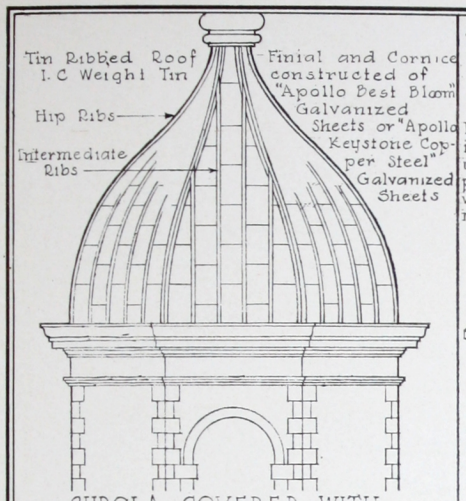
STUCCO CHIMNEY ON TIN ROOF



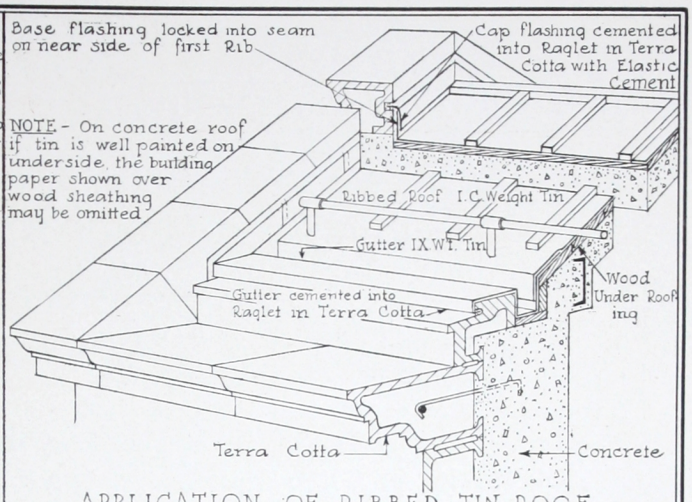
Lay cleat and plate with edges turned up (Fig 1). Nail cleats to sheathing 8 in apart (Fig 2). Turn cleat over nails (Fig 3). Lay adjoining plate in place (Fig 4). Turn top edge of plates starting lock (Fig 5). Turn lock again (Fig 6). Completed lock seam (Fig 7).

VARIOUS STEPS IN LAYING STANDING SEAM ROOF

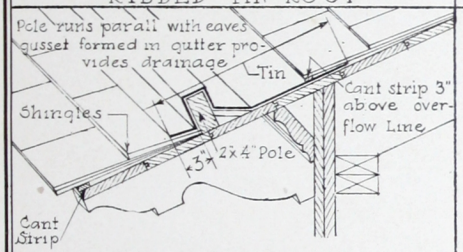
DRAWN BY SWEET'S CATALOGUE SERVICE, INC.	EXAMPLES OF LAYING AND FLASHING STANDING SEAM TIN ROOFS	SCALE 1½" & 3" EQUALS 1-0 DATE-JUL.'20	DRWG 2



CUPOLA COVERED WITH RIBBED TIN ROOF



APPLICATION OF RIBBED TIN ROOF TO PUBLIC BUILDING

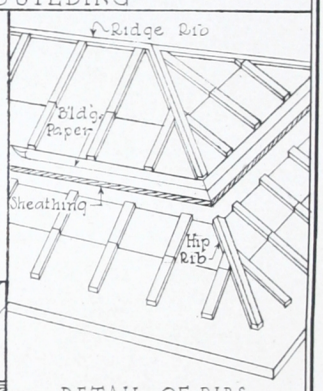


TIN GUTTER ON SHINGLE ROOF

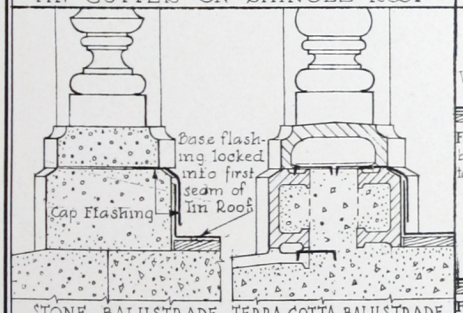
The quality of the material used for Roofing Plates is important

KEYSTONE COPPER STEEL

Look for this stamp—the Copper Steel alloy gives maximum wear and superior resistance to rust



DETAIL OF RIBS ON HIP ROOF



METHOD OF FLASHING AT BALUSTRADES

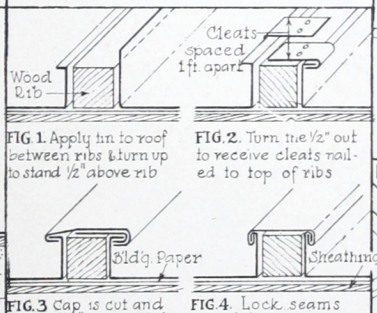


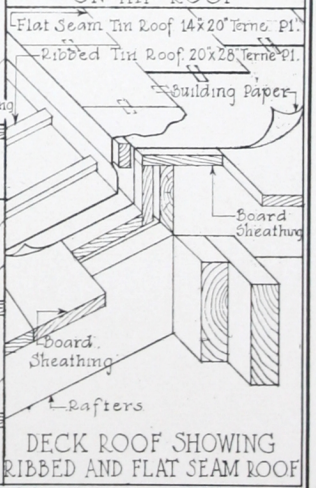
FIG. 1. Apply tin to roof between ribs & turn up to stand ½" above rib

FIG. 2. Turn the ½" out to receive cleats nailed to top of ribs

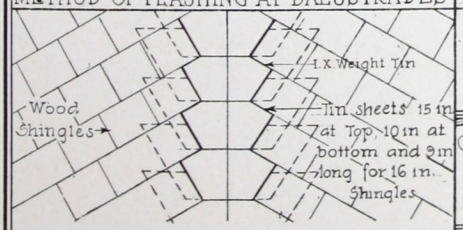
FIG. 3 Cap is cut and hooked ½" over roof tin

FIG. 4. Lock seams completed

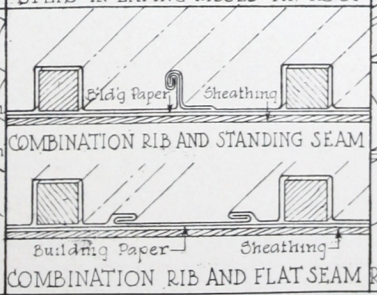
STEPS IN LAYING RIBBED TIN ROOF



DECK ROOF SHOWING RIBBED AND FLAT SEAM ROOF



METHOD OF FLASHING CLOSE VALLEY



COMBINATION RIB AND FLAT SEAM

DRAWN BY SWEETS CATALOGUE SERVICE, INC.	EXAMPLES OF LAYING AND FLASHING RIBBED AND COMBINATION TIN ROOFS	SCALE 1½" EQUALS 1'-0" DATE-JUL. 20	DRWG 3

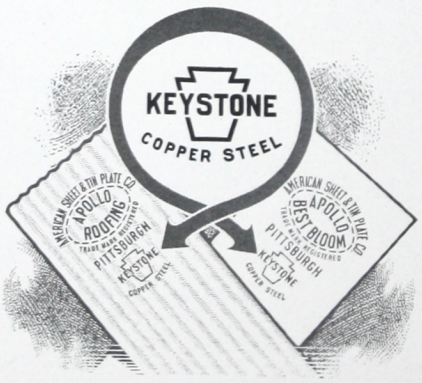
Galvanized Sheet Metal Work

In addition to the tin roof, the galvanized sheet metal work is an important feature of any building. Apollo Best Bloom Galvanized Sheets have been long and favorably known to the building profession, and their application to specific purposes, as well as to general lines of general sheet metal work needs no elaboration.

Apollo-Keystone Galvanized Sheets embody all the points of excellence of the old Apollo brand, but possess an added degree of rust-resistance by reason of the Copper Steel alloy used for the base. These sheets assure the positive maximum of wear and service for gutters, spoutings, eaves trough, ventilators, and all exposed sheet metal work, the details of which need not be shown, but are familiar to all builders and architects.

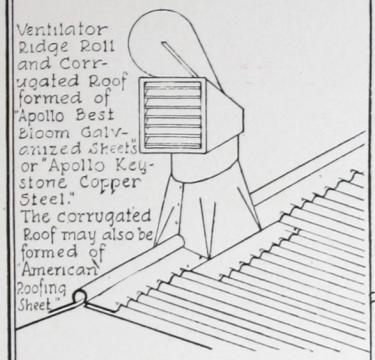
Corrugated Galvanized Sheets are largely used in fireproof and industrial construction. The details on opposite page will prove of value in designing work of this character.

Our pocket Reference Book is of particular interest to architects, draftsmen, and builders. It contains much valuable data and information relative to Corrugated and Formed Roofing and Siding material, as well as a full line of Sheet and Tin Mill products.

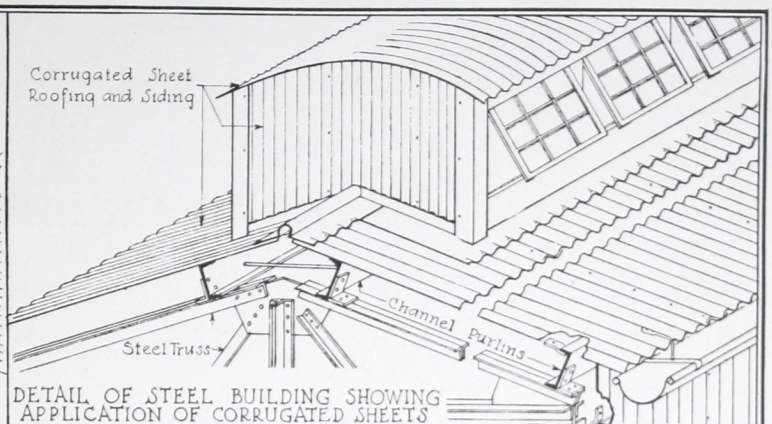


When copper-steel is used—the Keystone is added to regular brand.

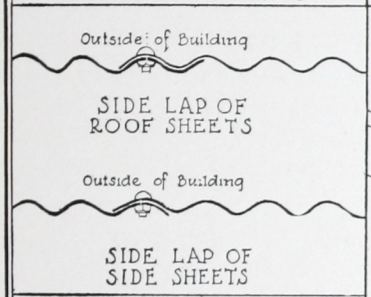
A feature of great value, that is often overlooked, is the positive protection against lightning which is afforded by a metal roof. When properly grounded, metal covered buildings offer the greatest safeguard against lightning and fire.

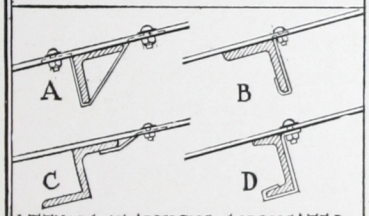


DETAIL OF RIDGE SHOWING FLASHING AT VENTILATOR

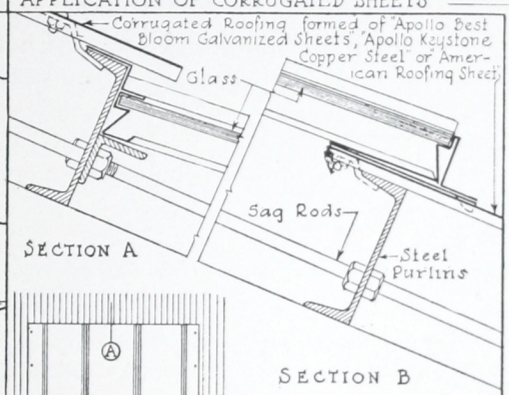


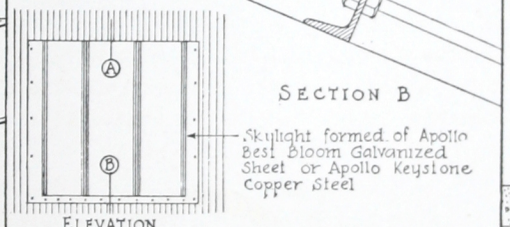
DETAIL OF STEEL BUILDING SHOWING APPLICATION OF CORRUGATED SHEETS



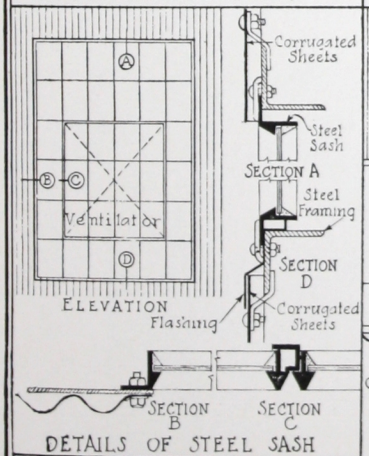


METHODS OF APPLYING CORRUGATED ROOFING TO STEEL PURLINS

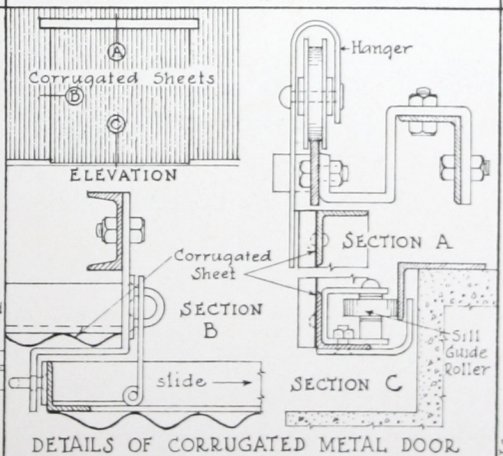




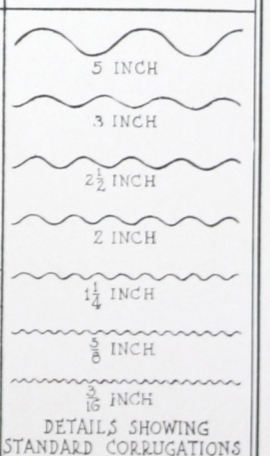
DETAILS OF SKYLIGHT



DETAILS OF STEEL SASH



DETAILS OF CORRUGATED METAL DOOR



DETAILS SHOWING STANDARD CORRUGATIONS

DRAWN BY SWEETS CATALOGUE SERVICE, INC.	METHOD OF APPLYING APOLLO KEYSTONE COPPER STEEL & APOLLO BEST BLOOM CORRUGATED GALVANIZED SHEETS	SCALE 3" EQUALS 1'-0" DATE-JUL'20 DRWG 4

Facts to Remember

Keystone Copper Steel is an *alloy* made by *adding* a certain amount of Copper to well made Steel thereby greatly increasing its rust resistance.

Look for the Keystone added to brand, as indicated by Apollo galvanized sheets shown above. Send for new Weight Cards, giving sizes, gauges, etc., etc.

Copper added to Steel is *not* an impurity, any more than Copper is an impurity in Brass or Bronze. It loses its identity as a metal by becoming thoroughly diffused with the Steel—thus forming a *new metal or alloy*.

Copper in Steel *does not increase* corrosion. On the contrary *it retards* corrosion. The tests and illustrations speak for themselves. If you do not believe them, make a test of your own.

Copper in Steel increases its *ductility*—makes it more workable. This Copper Steel Alloy is specially adapted for roofing and sheet metal work in building construction.

The growing demand for Keystone Copper Steel is the best evidence of its excellence. Its high reputation has been fairly earned—and has come as a result of its undeniable superiority in the hands of the users.

Keystone Copper Steel products were awarded the GRAND PRIZE (highest award) for *general excellence* and *greatest merit* and *highest development*, by the Panama-Pacific International Exposition, San Francisco. This high recognition followed very careful and thorough investigations by able juries, and is convincing evidence of the high quality of this material.

Carefully Manufactured—Unequaled in Service

American Sheet and Tin Plate Company

Manufacturers of Sheet and Tin Mill Products
for all purposes

Apollo Best Bloom Galvanized Sheets
Apollo-Keystone Copper Steel Galvanized Sheets
Black Sheets of Every Description
Keystone Copper Steel Black Sheets
Keystone-Wellsville Polished Steel Sheets
Corrugated Sheets—Black, Painted, Galvanized
Formed Roofing and Siding Products
Automobile Sheets—all Grades
Electrical Sheets
Special Sheets for Stamping
Keystone Copper Steel Roofing Tin
Long Terne Sheets
Bright Tin Plates
Black Plate, Etc.

Sixth Edition
(Revised)

1923

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